



S1 Global Plug Compatibility

CAD Tools
&
Collaboration

April 23, 2008

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Agenda



- Design Overview
- Common CAD Tools
- The EDMS environment
- Sharing data and working together
 - The pros and cons
- Beyond the paper specifications
 - Neutral 3-D model
 - BOM's and design variants
- Plug Compatibility
 - 3 methods for collaboration
 - Global Cryomodule Design
- Conclusions



Common CAD tools



- FNAL: I-DEAS v.12
- SLAC: Solidedge
- JLAB: I-DEAS
- INFN Milan: UG-NX & I-DEAS v.12
- INFN Pisa: I-DEAS v.12
- KEK: One Space Design, I-DEAS v.12
- DESY: I-DEAS v.12



Common CAD Tools (in a perfect world)



- Common CAD software: I-DEAS v.12m4
 - DESY supported
- Common database: DESY EDMS
 - Live
 - Daily use
 - Integrated with global collaboration
 - Web viewable data and BOM structure
 - CAD and data file storage
 - 3-D, 2-D, specs, engineering notes, etc.
- Visualization and collaborative meetings
 - Teamcenter visualization software
 - EDMS Licenses supplied by DESY
 - On-line collaborative meetings with file sharing.
 - WebEx meetings with desktop sharing



Team Center Enterprise EDMS Team Browser hosted by DESY



Team Browser

File Edit View Tools Manage Help

My Items

I-DEAS

Model File C:\DEAS\Model_Files\ILCYMO_031807_T4CM-9_COMPL_ASSY.mfl

- Main
 - COLD_MASS_T4CM-9_CAVITIES_ASSY, D0000000613373, v5
 - T4CM-9_CAVITIES_NEW_COMPL_ASSY, D0000000608303, v8**

Team Data

Teams for Orlov_Youri_FINAL

- DESY-FNAL-CAD-Test
- IPP_Training
- Type 4 Cryomodule Design
 - 1-3GHz CAVITY
 - CAD Main Assemblies
 - CAVITY_STRING-9_ASSY, D0000000602033, v16
 - CAVITY_STRING-ASSY-T4CM_NO-MAGN, D0000000563503, v3**
 - CAVITY_STRING-T4CM-DELETE-ME, D0000000557733, v1
 - COLD_MASS_ASSY_T4CM, D0000000556753, v23
 - COLD_MASS_T4CM-9_CAVITIES_ASSY, D0000000613373, v4
 - COLD_MASS_T4CM_W_MAG_ASSY, D0000000611633, v14
 - COMPLETE_ASSEMBLY_T4CM-9, D0000000602203, v1
 - HGR_PIPE_ASSY-T4CM_NO-MAGN, D0000000563493, v4
 - HGR_PIPE_T4CM-9_ASSY, D0000000602003, v12
 - T4CM-9_CAVITIES_NEW_COMPL_ASSY, D0000000608303, v7
 - T4CM_COMPLETE_ASSY_NO-MAGN, D0000000563663, v12**
 - T4CM_W-MAG_COMPLETE_ASSEMBLY, D0000000556493, v18
 - VESSEL_CRYOSTAT_T4CM-9_MACH, D0000000601903, v13**
 - CAD Working Data
 - CAD Working Data-No Magnet

My Teams My Subscribed Items

No Changes Required
Ready...
Delete 1 items from the model file

Name	Number	ItemType	Version	Status	Pr...
T4CM-9_CAVI...	D0000000608303	Assembly	8	Ck	-

Name	Number	ItemType	Version	Status
BELLOWS_T4...	D0000000557123	Assembly	2	Rfl
COLDMASS_...	D0000000603463	Assembly	2	Rfl
COLDMASS_...	D0000000552763	Assembly	16	Rfl
COLDMASS_...	D0000000552803	Assembly	16	Rfl
JACK_STAND...	D0000000776912	Part	1	Rfl
JACK_UP_SP...	D0000000733782	Part	1	Rfs
MC_MOUNT_...	D0000000557603	Assembly	21	Rfl
MC_WARM_A...	D0000000578523	Assembly	6	Rfl
MOUNT_TAY...	D0000000605373	Assembly	2	Rfs
REDUCING_TE...	D0000000613853	Assembly	1	Rfl
RING_HOIST_...	D0000000746892	Part	1	Rfl
SURVEY_PLA...	D0000000578763	Assembly	7	Rfl
T4CM-9_HAR...	D0000000613943	Assembly	1	Rfl
TEMP_T4CM-9...		Drawing		
VESSEL_CRY...	D0000000601903	Assembly	13	Rfl

Details Search Results

CAD data portal



Team Center Enterprise EDMS Thin-Client hosted by DESY



My Teams: Type 4 Cryomodule Design: CAD Main Assemblies - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail New Tab Close

Address: http://teamcenter.desy.de:2345/TC51PRD/controller/home

Search Home Exit DESY

Advanced Search... Donald Mitchell

Main Menu Explorer

Check Out From Team Put to WIP Vault Make Available To Team Route Move More Actions...

My Teams: Type 4 Cryomodule Design: CAD Main Assemblies

You are here: Type 4 Cryomodule Design: CAD Main Assemblies

EDMS-ID	Name	Description	Life Cycle State	Project Name	Class	Cr
D00000000556753.A.1.1.2	COLD_MASS_ASSY_T4CM	COLD_MASS_ASSY_T4CM	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000563513.A.1.1.3	COLD_MASS_ASSY_T4CM_NO-MAGN	COLD_MASS_ASSY_T4CM_NO-MAGN	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000611633.A.1.1.6	COLD_MASS_T4CM_W_MAG_ASSY	COLD_MASS_T4CM_W_MAG_ASSY	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000613373.A.1.1.9	COLD_MASS_T4CM-9_CAVITIES_ASSY	COLD_MASS_T4CM-9_CAVITIES_ASSY	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000602063.A.1.1.3	COLDMASS_T4CM-9_ASSY	COLDMASS_T4CM-9_ASSY	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000602203.A.1.1.3	COMPLETE_ASSEMBLY_T4CM-9	COMPLETE_ASSEMBLY_T4CM-9	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000621533.A.1.1.7	G2_VESSEL_CAVITY_ASSEMBLY	G2_VESSEL_CAVITY_ASSEMBLY	Working	Type 4 Cryomodule Design	Assembly	Gr
D00000000555263.A.1.1.9	HGR_PIPE_ASSY-T4CM	HGR_PIPE_ASSY-T4CM	Working	Type 4 Cryomodule Design	Assembly	Or
D00000000563493.A.1.1.4	HGR_PIPE_ASSY-T4CM_NO-MAGN	HGR_PIPE_ASSY-T4CM_NO-MAGN	Working	Type 4 Cryomodule Design	Assembly	Or

svr <6529> low_freespace: memory is already free
e 2 assignments in this Work List.

Web data access



- Documents:
 - Easily shared by all team members
 - Software independent
 - PDF files created automatically
 - Revision control is managed easily
- CAD data
 - Currently supports one CAD system: I-DEAS
 - Automatic creation of drawing viewing files
 - Automatic creation of 3-D viewing files
 - Revision control is managed easily



- Advantages:
 - Web-based control of documents; no need to send files around to team members
 - Live data: always up-to-date snapshot of design and parameters
 - 1 working model shared by entire team
- Disadvantages:
 - 1 CAD tool requires all players to migrate to one software package. Very challenging!
 - Training: Regional training and compliance to rules. Cost of setting up and maintaining a training program.



Design Collaboration (in the real world)



- Not likely that every lab will use the same CAD package
 - “live” data maintained at each institution
 - 2-D & 3-D visualization files must be shared
- DESY EDMS can and should be used.
 - Data maintained in EDMS
 - Project parameters
 - Engineering documents
 - Neutral CAD files (JT's, CGM's, PDF's)
 - Revision control in EDMS
 - BOM's (manually constructed or CAD related)
 - Variances in the design (alternate BOM's)



Real-Time Viewing of the Design



- Designs should be:
 - Current and up-to-date
 - Maintained in one system
 - Easily accessible
 - Show all design proposals
 - Maintained in a neutral format that anyone can view without the need of a CAD package
 - JT's for viewing solid models
 - CGM and PDF for viewing drawings
 - PDF for viewing documents



How do we get there?



- Initial EDMS organization:
 - Projects and teams
 - EDMS training
 - Upload Documents
 - Manual system level BOM construction
- Creation of CAD models and related to the system level BOM structure
- Master 3-D model maintained by a core team
 - Import, convert, or create neutral, JT CAD models
 - Combine the JT's into conceptual models
 - Maintain the master JT models in DESY's EDMS



Plug Compatibility How do we collaborate?



- 3 Approaches for collaboration
 - 1. DESY Model
 - ALL users will use I-DEAS, ILC-EDMS
 - 2. One central model
 - Maintained in ILC-EDMS in I-DEAS
 - Collaborators use I-DEAS or supply STEP files that must be imported into I-DEAS and then uploaded into the EDMS
 - very labor intensive
 - Design is usually out-of-date
 - Data uploads always create new items in EDMS
 - ❖ No version control with STEP file imports
 - 2-D Drawings are not imported easily



Plug Compatibility, cont.



- 3. JT neutral format
 - 3-D model maintained in I-DEAS & ILC-EDMS
 - Collaborators work in any CAD package but must be able to create their own JT files
 - Users upload their JT files into EDMS
 - JT files are *revision* controlled
 - Newer JT files become the next revision
 - new EDMS items are not created
 - EDMS numbers are retained
 - Master 3-D model maintained by 1 institution
 - JT files imported into the I-DEAS model or VisView Mockup
 - Automatic EDMS notification when newer JT file is available
 - Master JT model checked into EDMS
 - Complete master JT available via EDMS by all users
 - Downloadable through EDMS thin client (web)
 - 3-D only, does not include 2-D drawings



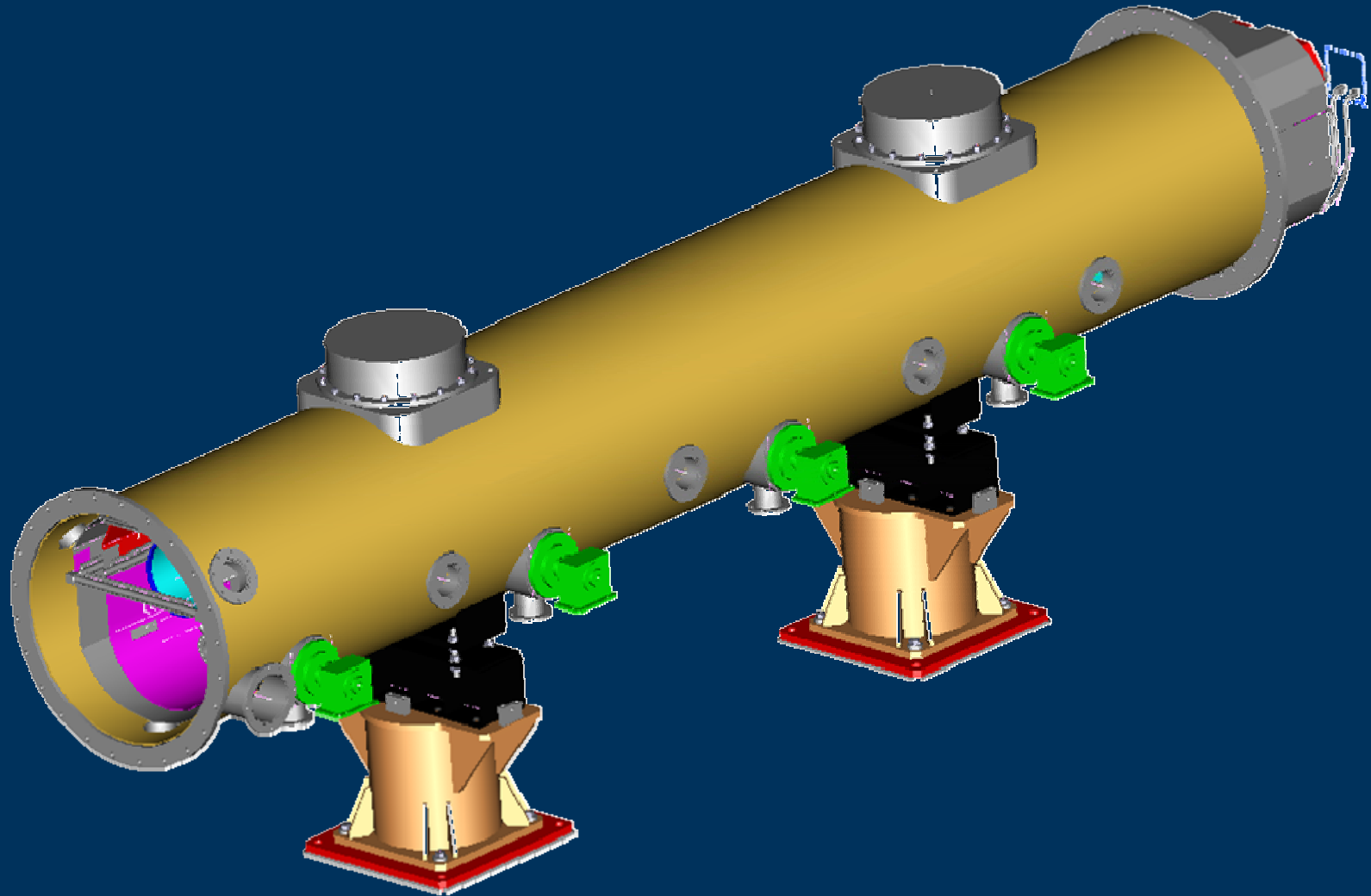
Plug-compatible CM design



- KEK STEP files were imported into I-DEAS
- JT files were created of the KEK designs
- In Vis-View Mockup, JT files were merged together. They included:
 - DESY dressed cavity
 - FNAL dressed cavity
 - KEK cryomodule and cavity
- KEK cavities were replaced with DESY and FNAL cavities
- An analysis of *form* and *fit* was performed
- *What if* scenarios can be explored

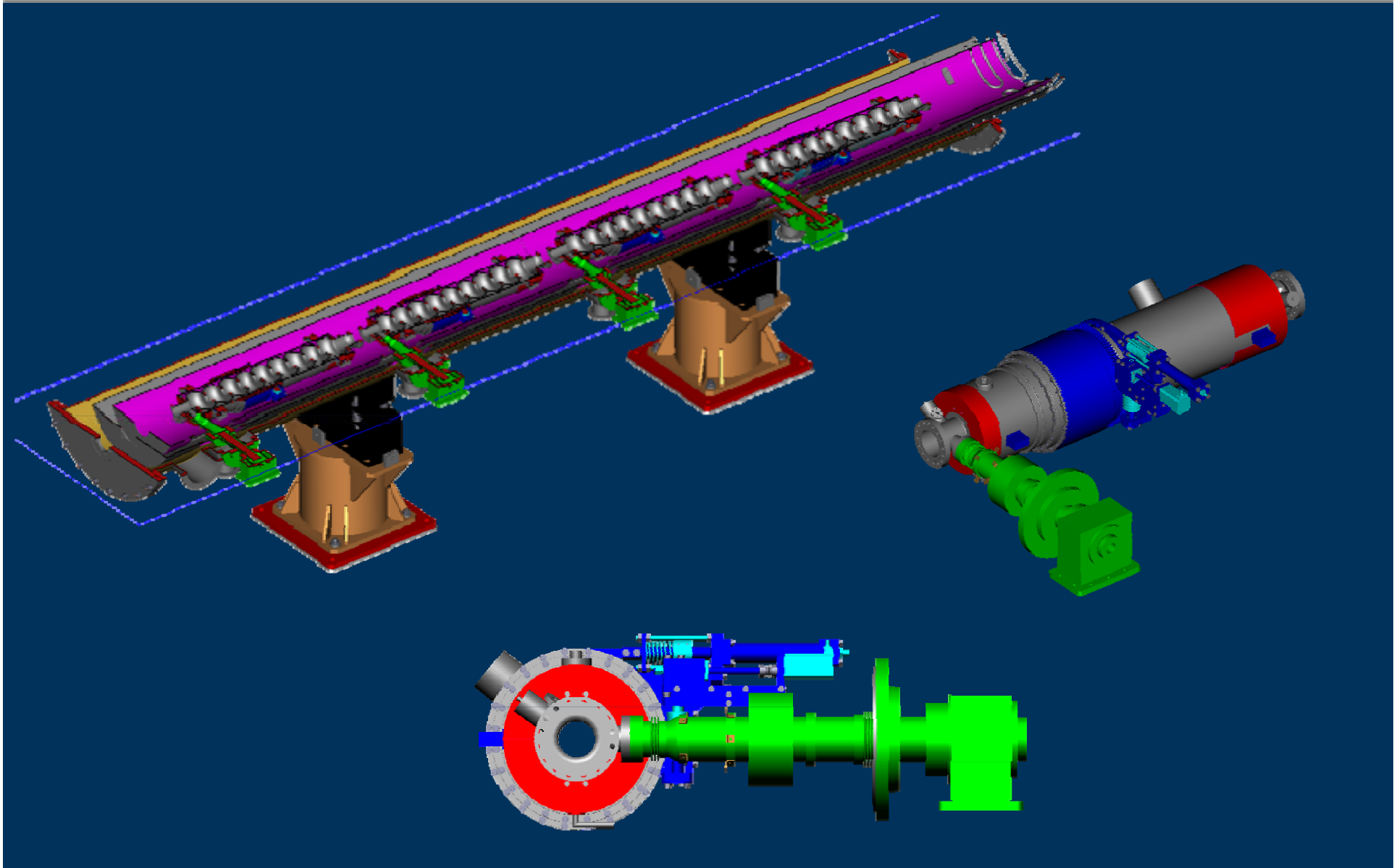


The KEK STF Model



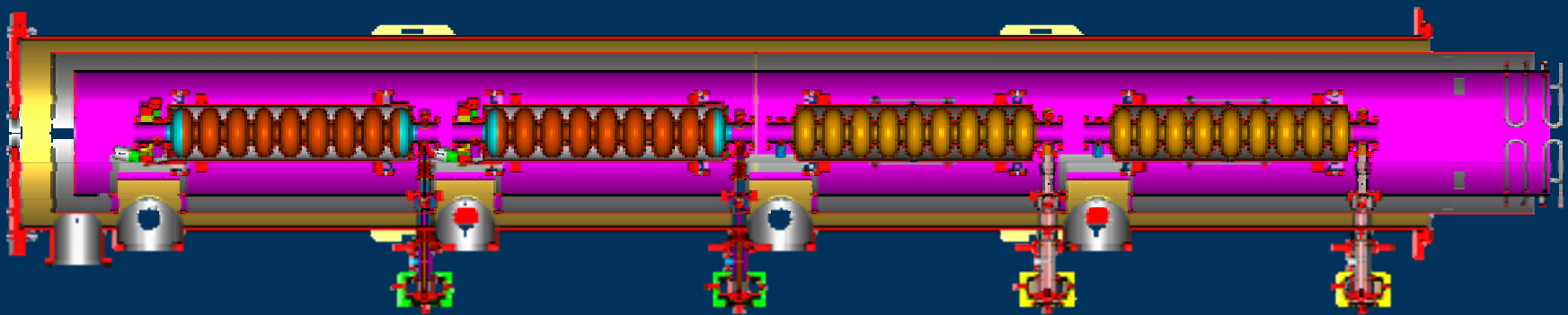
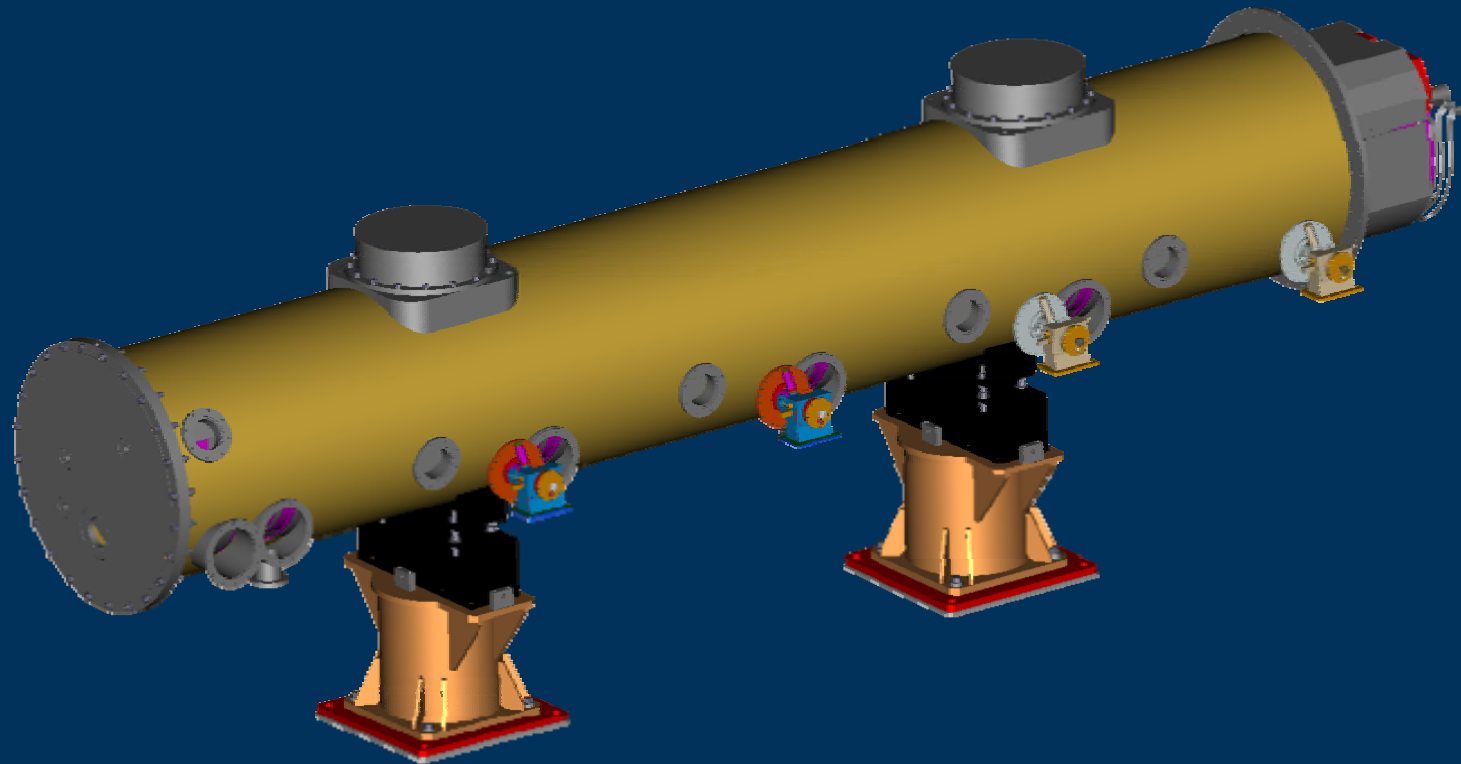


KEK Cryomodule Cross-section



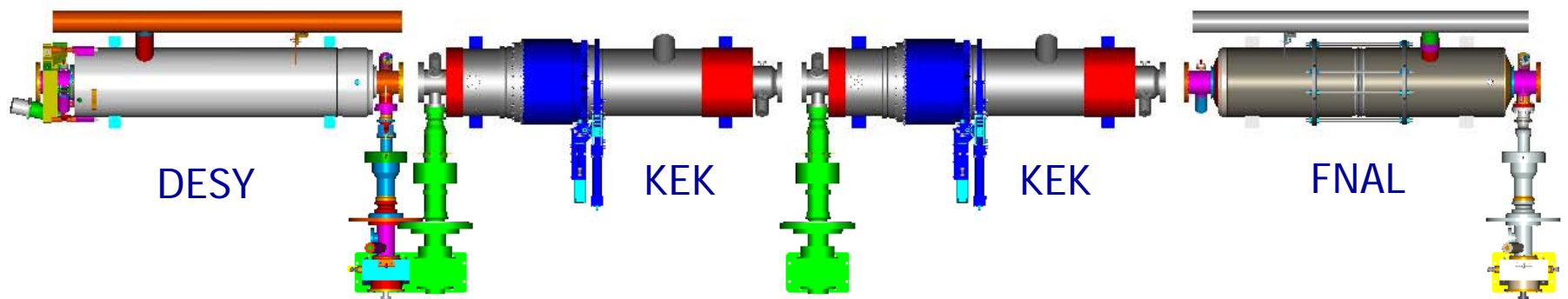
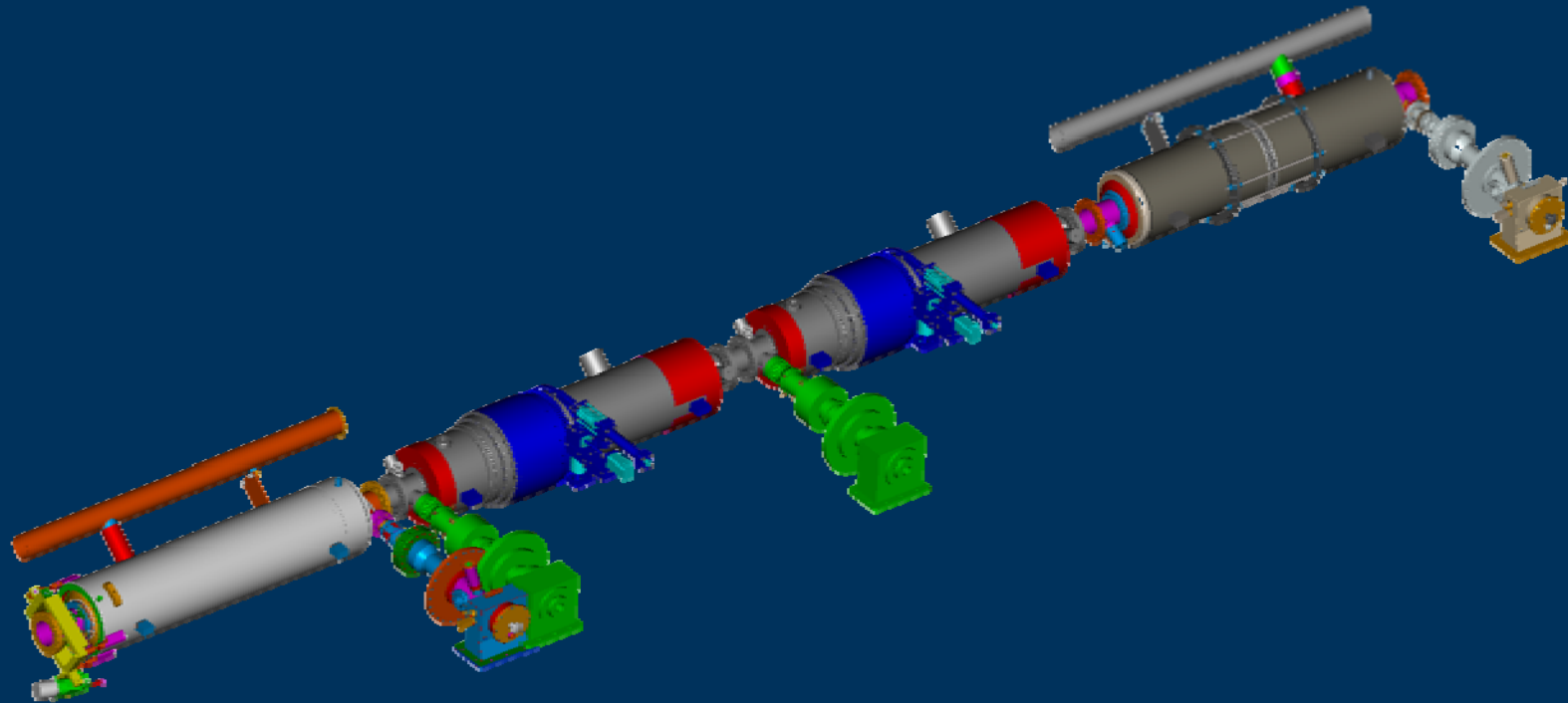


KEK Cryomodule with DESY and FNAL Cavities





Combined Cavity-String for comparison

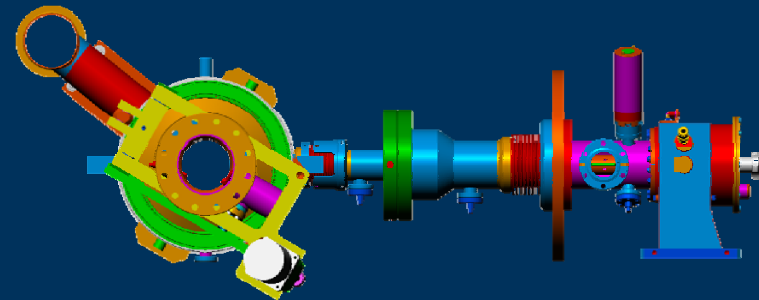
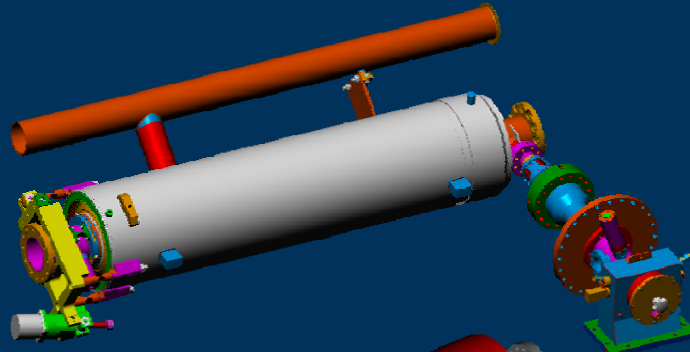




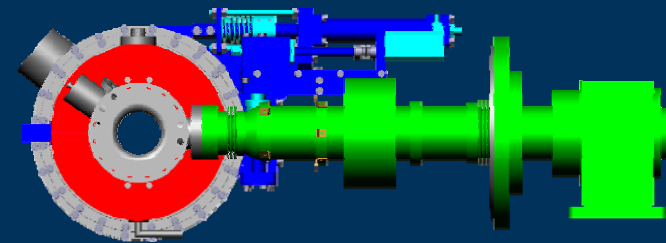
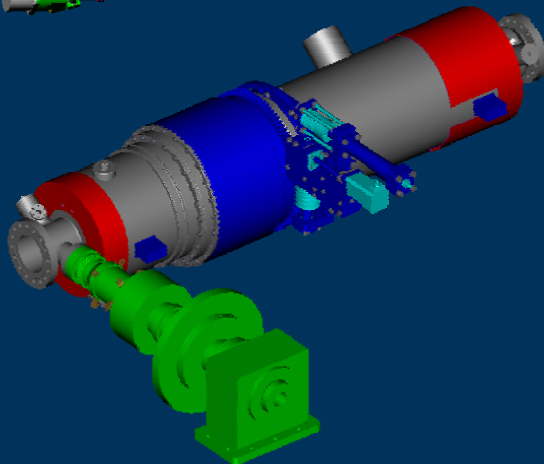
DESY / KEK / FNAL Cavities



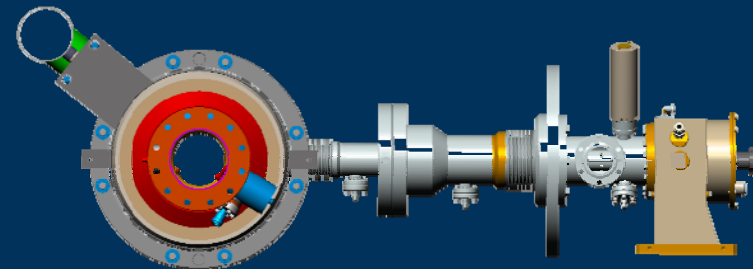
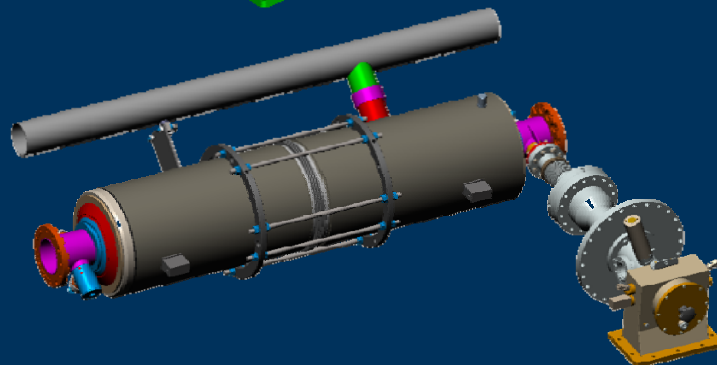
DESY



KEK

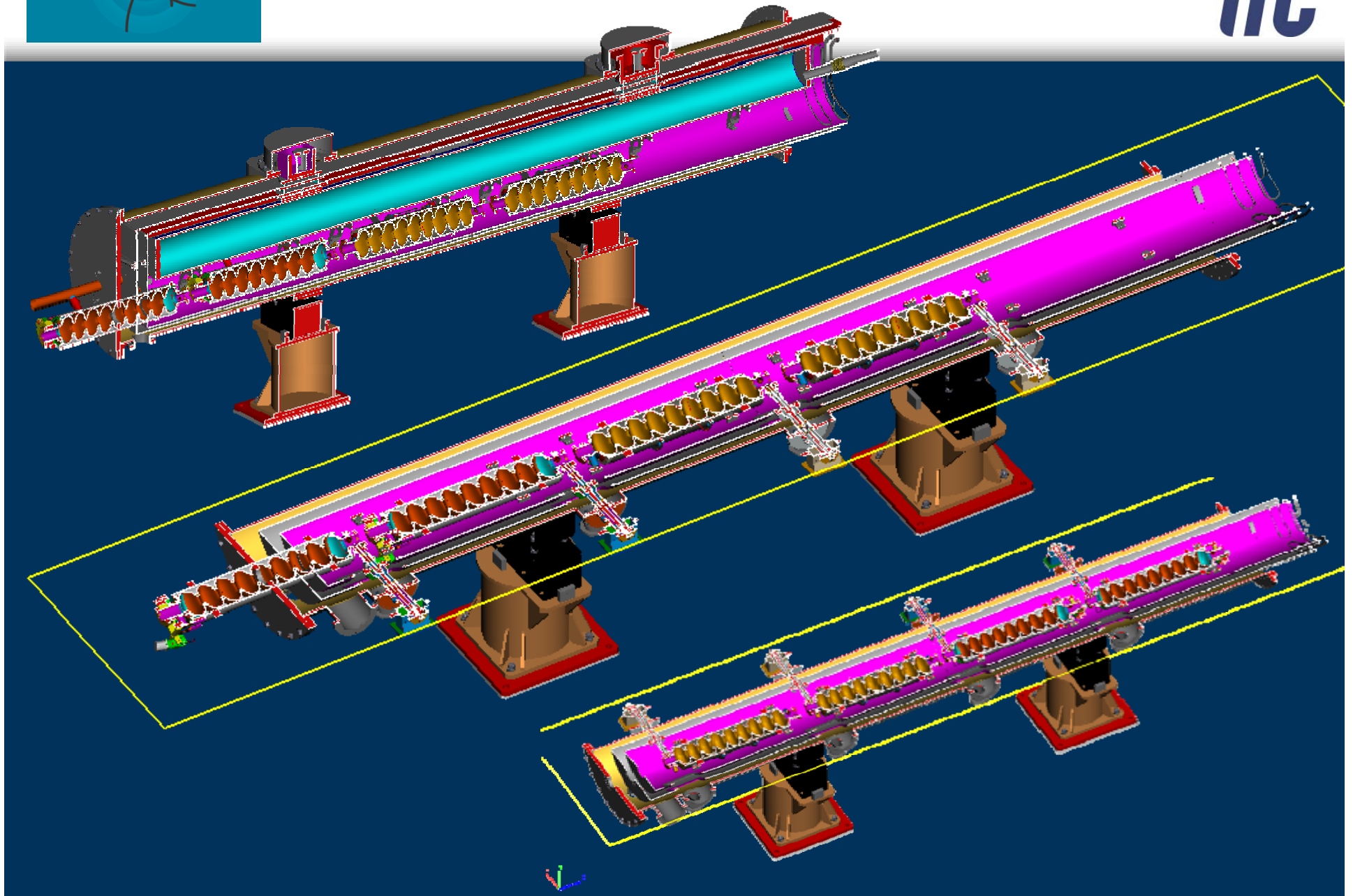


FNAL





Design Variants





Conclusion



- We need to decide which data management method will be implemented for design collaboration.
- A common coordinate system is needed.
- CAD rules need to be identified and followed.